is varied by the screw I, which moves the plates M N. Finally, the prism F throws the light into the field of A. The whole is attached to the tube H, which slides into the end of the telescope. This photometer is light, can be easily removed, and by a suitable adapter may be attached to any telescope. As it forms a single piece, the adjustments are little liable to be disturbed.

In some observations, especially during twilight or moonlight, errors were apprehended from the comparative darkness of that half of the field covered by the prism F. This prism was replaced in other forms therefore by a piece of parallel glass. They were then called photometers E′ and J. The reflected stars they formed were much fainter, and double, one image being produced by each surface of the glass. Still these instruments had the advantage that the field was unobstructed, and the star to be measured might be placed in any desired position, as regards the standard.

The latter class of photometers can be used only in the measurement of faint stars. If the image of the object seen in the large telescope is brighter than that formed by the auxiliary telescope, no setting of the Nicols or micrometer screw will render them equal. This difficulty was obviated by using the photometer shown in Fig. 4, removing the Nicols, and replacing its eye-piece by the concentric tubes referred to in an early part of this analysis. The images of the same object, seen in the large and small telescope, were first compared, and the constant thus found was used in reducing the observations of other objects. The advantages of this photometer are that stars of greatly different brightness and in different parts of the sky may be compared; but the loss of light is great, and the images are seen under different magnifying powers.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The Board of Natural Science Studies have recommended a new set of regulations for the Natural Sciences Tripos, to take effect as regards the first part of the examination, in the Easter Term of 1881, and as regards the second part in Easter Term of 1882. In effect it is intended to provide for a class list in general natural science honours in June each year, founded on aggregate knowledge shown by candidates in the first part of the examination, provided no credit is given in a subject unless the candidate has shown a competent knowledge of that subject. Each of the three classes is to be arranged in alphabetical order. The general arrangement of subjects and practical work has already been settled, but the details will no doubt invite attention. The working of Regulation 6 is rather curious. "In the first part of the examination there shall be a practical examination, either written or *vivâ voce*, or both, in such subjects as the Board of Natural Science Studies shall from time to time determine, provided that in all those subjects in which there is no such practical examination, one or more of the questions in the printed papers refer to objects exhibited at the examination." Regulation 7 states that there is to be a practical examination either written or *vivâ voce*, or both, in each of the eight subjects of examination in the second part. Regulation 14 proposes that, in arranging the class-list for the second part of the examination, the examiners shall have regard to general knowledge and ability as well as to special proficiency in one or more subjects. No candidate shall obtain a first-class for proficiency in one subject unless he show a competent knowledge of some cognate subject. When Human Anatomy is taken as the principal subject, either Zoology and Comparative Anatomy, or Physiology, be taken as a necessary cognate subject. Regulation 15 includes the following:—In each case of giving a first-class in the second part of the examination, the examiners shall specify the subjects for which the candidate is so placed, or the reason for specially distinguishing him.—A discussion in the Arts School on the proposed regulations for the Natural Sciences Tripos (on October 31), was opened by Mr. Sedley Taylor expressing great doubts about the desirability of giving such a prominent place to human anatomy in an honours examination. He read to those present the opinions of three eminent physiologists and anatomists specially obtained by himself on this point, and they were, on the whole, against the proposed regulation as unnecessary, if human anatomy were to be taught in the only way in which it could fairly enter into the Tripos, for its general and not its professional value, while usually the memory work involved was enormous, and such as to be of quite technical character. Dr. Humphry strongly supported the regulations and the distribution of subjects, as a method of aiding in preserving a scientific study of human anatomy. Dr. Paget dissented strongly from this view, not as a means of discouraging the study of anatomy, but to lessen the strain of constant change by questions which went to the root of the matter. He believed no sufficient settlement could be expected unless or until the Tripos was divided into two—biological and non-biological; it was unwieldy and unmanageable in its present state. Surely it was not impossible to frame some division of subjects which might secure this and be found workable. Mr. Balfour did not agree with the way in which human anatomy was regarded as so far apart from the anatomy of all other animals as to gain such distinctive marks, while no such division was made in physiology. Mr. Trotter thought it would be quite impracticable to enter upon the discussion of the Tripos at present, and that it would be impossible to divide the subjects into biological and non-biological. The geologists would object. Mr. J. N. Langley testified to the difficulty men often found in choosing or combining their subjects. Mr. Bettany strongly supported Dr. Paget's projected division of the Tripos into two, but with this difference, that men who gained a degree in the first part of the Tripos, as now proposed, in the "comparatively elementary" parts of the subjects, should be allowed to gain their final class in either biological or non-biological subjects, without such complex and often uncertain or vague regulations to puzzle candidates.

THERE can be little doubt as to the health of Cambridge being good, and the increasing confidence in Cambridge as a place of education, in view of two facts, viz., that the death-rate during the Michaelmas quarter has been only at the rate of thirteen per thousand, per annum; including only six deaths from the seven principal zymotics; and that the entry of freshmen at the colleges this year is the largest ever known, having increased by at least one hundred. It is the more incumbent on the university or the colleges, to see that space for exercise, recreation, study, and sleeping are fully provided for every undergraduate, and to take an active part in preventing disorderly men from remaining to vitiate others; and it is equally the duty of every wise man not to tempt our youth into overstrain of body and mind.

MR. PATTISON MUIR, Caius Prælector in Chemistry, lectures on the Metals this term, and also on Advanced Systematic Chemistry to Tripos candidates. Professors Liveing and Dewar have issued a notice of great importance to those desirous of prosecuting researches in chemistry. The new rooms added to the Chemical Department will enable them to accommodate a limited number of students who have had the necessary training and are desirous of prosecuting chemical research or of acquiring skill in special branches of chemistry. Applications for permission to prosecute researches must be made personally to the Professors, and all investigations must be subject to their approval. Mr. A. Scott, B.A., Prof. Dewar's assistant, will have the general superintendence of this part of the laboratory.

A COURSE of practical instruction in Experimental Physics will be given in the Cavendish Laboratory during this term. The course will be adapted to the requirements of beginners, and demonstrations will be given daily at times to be arranged with the members of the class. Thus again one of the most necessary classes is to be provided, but we trust Mr. Garnett's energies in this department will not be overtaxed.

OXFORD.—In a congregation to be held on November 18, the amendments to the proposed statute respecting degrees in Natural Science will be considered. As the proposed statute now stands, scholars in the Faculty of Natural Science may offer for Responsions Greek and Latin, or Greek or Latin with either French or German, and shall also be examined in arithmetic, the elements of plane geometry and algebra up the binomial theorem. An amendment has been proposed by Prof. Rolleston to substitute the elements of deductive logic for algebra beyond proportion. In moderations (first public examination), Prof. Rolleston proposes to insert deductive and inductive logic as an alternative for algebra. Candidates will be obliged to offer either Greek or Latin, with either French or German, and will be examined in the theory of logarithms, Euclid, trigonometry as far as the solution of plane triangles, and elementary mechanics. The council have proposed amendments abolishing those clauses granting the rights of Masters of Arts to Masters of Natural Science, since counsel's opinion has given it to be beyond the power of the University to grant such privileges to a new faculty. The council will accordingly propose a decree authorising the Vice-Chancellor to take whatever steps may be necessary to ob ain

the power of conferring on Masters in Natural Science the rights and privileges at present enjoyed by Masters of Arts.

The statute providing that there shall be two examiners in each of the three branches of the natural science school will come into operation this term. The three new examiners will be Dr. Odling in Chemistry, Prof. Ray Lankester in Biology, and Mr. W. N. Stocker, Brasenose, in Physics.

Dr. Acland, Regius Professor of Medicine, will give a public lecture at the Museum, November 20, on the new hospital at Baltimore, U.S., and its relation to the medical studies at the Johns Hopkins University, and to general medical education.

Mr. C. J. Baker, of Manchester Grammar School, has been elected to the Physical Postmastership at Merton College.

THE Board of Trinity College, Dublin, have elected Dr. Alexander Macalister to the Professorship of Anatomy, and Chirurgery, in Dublin University, vacant owing to the resignation of Dr. B. McDowel. Prof. Macalister still retains his Professorship of Comparative Anatomy, but resigns the Professorship of Zoology and the Directorship of the Zoological Museum. The election to the former of these posts we observe is fixed for an early day in this month; the nominators are the members of the academic council of the University of Dublin, with a veto on the person nominated by the board. The election to the Directorship of the museum is in the hands of the board, and to this the person elected has always been the professor of zoology. The yearly emolument from both posts is between 300*l.* and 400*l.* a year.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 9.—Questions in molecular physics figure largely in this number. Herr v. Wroblewski inquires into the nature of absorption of gases, by a kinematical method, inferring from the phenomena of motion of gases diffusing in absorbent substances, the condition in which they exist in these. The phenomena in caoutchouc are studied, and the author concludes, *inter alia*, that the absorption of protoxide of nitrogen, carbonic acid, and hydrogen by caoutchouc is a purely physical process, and the gases retain, after absorption, their gaseous state and all characteristic properties. The constant of diffusion of a gas depends only on physical properties, and chiefly its specific gravity, being approximately inversely proportional to the square root of this; but the specifically lighter gases show greater constants than this relation expresses. The constant for protoxide of nitrogen and carbonic acid increases with increase of temperature, and at 10° C. is fifty times smaller than that for carbonic acid in water. A caoutchouc membrane is to be conceived as a porous plate endowed with gas-condensing and rarefying powers (the gas moving through the pores).—M. Chappuis investigates the condensation of gases on a glass surface by a similar method to Magnus's, viz., measuring the expansion between two exactly known temperatures, of a certain volume of gas at constant pressure in contact with a large glass surface, and inferring the original volume of the gas. The numerical results for hydrogen, air, carbonic acid, sulphurous acid, and ammonia, from 0° to 100° and 180°, are given, and utilised in determining the absolute coefficient of expansion at constant pressure (a slight correction of the former determinations being necessitated by the phenomenon in question). Magnus's statement that at 100° there is no condensed gas layer on a glass surface is shown to be incorrect in the case of ammonia.—A paper by Herr Schleiermacher treats of the quantity of liquid condensed on a moistened body. The author rejects Wilhelmy's numerical values for the condensation, and considers that, in determining the specific gravity of a liquid, if one be content with an accuracy of 0·002 per cent., the influence of condensation may be neglected; in general the coefficients of condensation would be, at the most, of the order of 0·00001 $\frac{g}{Sq.\ ctm.}$.—The specific heat of water is anew determined by Herr Heinrichsen, who arrives at the number 1·071 (for 100°); this stands about midway between Regnault's result, 1·013, and Jamin's, 1·122. (Stamo got 1·125, and Münchhausen 1·030.)—Herr Koch finds that the oxygen-polarisation of platinum and palladium increases the friction of these metals to a glass surface coated with water or dilute sulphuric acid.—Mr. B. O. Peirce, jun., shows from experiments how greatly the electromotive force of gas elements depends on the nature of the electrolyte.—Herr Edlund, replying to a criticism by Herr Dorn, gives experimental evidence that the electromotive force in passage of liquids through tubes depends directly on the velocity, and not on the pressure; also that it is inversely proportional to the cross-section; and explains the facts observed by the unitarian theory.—Herr Fenkner expounds some laws of transverse vibrations of metallic cylinders open at one end.—Remaining papers:—Researches on anomalous dispersion of light, by Herr Sieben.—Researches on the height of the atmosphere, &c. (continued), by Herr Ritter.—On the electromotive force of the Grove element in units of Siemens and Weber, by Herr Riecke.

THE *Journal of the Royal Microscopical Society*, vol. ii. No. 6, October, contains the *Transactions* of the Society.—On a new species of Cothurnia, by John Davis; with Plate 20. Cothurnia is a genus of stalked infusoria very closely allied indeed to Vaginicola. Mr. Davis's new form is apparently very correctly referred to it; but if so, his species is not a rotifer, and, we presume, does not possess a mastax. The infusorian is described as much smaller than its lorica, and is so figured when contracted; this is not characteristic of a rotifer.—On some causes of Brownian movements, by Dr. W. Ord. Observations suggested by the study of *Amphipleura pellucida* mounted in Canada balsam, by lamp-light and sun-light, with various objectives, by Col. Woodward.—On Abbè's experiment on *Pleurosigma angulatum*, by Col. Woodward.—On new species and varieties of diatoms from the Caspian Sea, by Dr. A. Grunow; translated, with additional notes, by F. Kitton; with Plate 21.—The Record of current researches relating to invertebrata, cryptogamia, and microscopy. This record forms a most valuable portion of this journal. It occupies over 100 pages of this number, and, as far as one can judge, the notices give a very fair epitome of the papers quoted. The attempt to make this record a complete one of the invertebrates and of cryptogams is praiseworthy, but it seems to us that our yearly zoological and botanical records already do this in a fairly perfect way. Would it not be better that this bi-monthly record should confine itself to those papers of special interest to the microscopist. In this record references to papers of the type of Fischer on *Voluta musica*, Norman on Solenopus, or Pfeffer on Philippine pteropods, might be omitted. Only those who have worked at compiling bibliography know the great labour and skill required to keep up such a record; and certainly the editor of this journal deserves the special thanks of all workers with the microscope.

THE *Gazetta Chimica* (fasc. vi. and vii.) contains the following papers:—On the chlorides and oxychlorides of tungsten, by U. Schiff.—On a method of preparing economically the bibasic citrate of quinine, by F. Dotto-Scribani.—Researches on *Satureja juliana*, by P. Spica.—Chemical researches on the salts obtained from the mother liquors of the salt works of Volterra, by A. Funaro.—Chemical analysis of a Chilian chrysocolla, by N. Pellegrini.—On a singular decomposition of the chlorhydrate of phenyl-ethyl-amine, by M. Fileti and A. Piccini.—On some neutral ammonia salts (citrate, phosphate, photosantonate), by F. Sestini.—New experiments on resinous substances, by G. L. Ciamician.—On the isomeric nitrosalicylic acids, by U. Schiff and F. Masino.—On the pretended artificial tannic acid, by P. Freda.—On piperidine, by R. Schiff.—On the action of cyanide of potash on the ammoniacal derivatives of chloral, by R. Schiff and S. Speciale.—On the crystalline forms of anglesite from Sardinia, by Q. Sella.—On the forms of crystallisation of some substances belonging to the aromatic series, by R. Panebianco.—On lithofellic acid and some lithofellates, by G. Roster.—Chemico-mineralogical researches on the lavas of the volcanoes of the Ernici in the Valle del Sacco (Rome), by S. Speciale.—On the discovery of nitric acid in the presence of nitrous acid, by A. Piccini.

THE *Rivista Scientifico Industriale* (Nos. 17 and 18).—From these numbers we note the following papers:—On a new method for determining the distribution of magnetism in magnets, by Prof. G. J. Agostini.—On the electromotive forces developed by saline solutions of different degrees by concentration with the metals which form their base, by A. Eccher Dall' Eco.—On the temperature of the voltaic arc and of the positive and negative polar extremities of the carbons during the production of the electric light, by Prof. Rossetti.—On the decomposition of chlorhydrate of ethyl amine by heat, by M. Fileti and A. Piccini.—On the preservation of dragon flies with fading colours, by Prof. Pietro Stefanelli.—On a new hydrometer for measuring the water supplied to steam-boilers, and called "Isaghidrometro" by its inventor, Sig. Massarotti.—On the work which can be performed by the beams of certain aquatic motors, by Cesare